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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/535,315	05/17/2005	Robert F Richards	67901-17	5991

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EXAMINER
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VORTMAN, ANATOLY

ART UNIT	PAPER NUMBER
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2835

MAIL DATE	DELIVERY MODE
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09/26/2007

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	Application No. 10/535,315	Applicant(s) RICHARDS ET AL.	
	Examiner Anatoly Vortman	Art Unit 2835	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☐ Responsive to communication(s) filed on 20 August 2007 (Election).
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-43 is/are pending in the application.
- 4a) Of the above claim(s) 12,22-24,28-32,37,38 and 41-43 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-3,10,14,15,21,25-27,33-36,39 and 40 is/are rejected.
- 7) ☒ Claim(s) 4-9,11,13 and 16-20 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>4/17/06</u> .   | 6) <input type="checkbox"/> Other: _____                          |

**DETAILED ACTION*****Election/Restrictions***

1. Applicant's election with traverse of Group I, Specie II, claims 1-11, 13, 14-22, 25-27, 33-36, 39, and 40, in the reply filed on 08/20/07 is acknowledged. The traversal is on the ground(s) that regarding Fig. 6A-6B specification "states [...] that membrane deflection may be caused by an electrostatic force, a piezoelectric force, a magnetic transducer" therefore, Applicant contends that "it is incorrect to characterize the species selection on the basis of the actuation mechanism". This is not found persuasive, because there are distinct species claimed: one with piezoelectric actuation, another one with electrostatic actuation. Fig. 6A, 6B are representative figures, which show the specie with droplets present. Thus, contrary to the Applicant's position, the Species are characterized by the presence (or the absence) of the droplets and by the actuation method. Further, regarding Fig. 8, Examiner agrees that Fig. 8 is not belonging to Specie I, because of the depiction of the droplets (132). Further, elected claim 22 reads on the non-elected Specie III, because of the recitation of the plurality of the thermal switch elements (i.e. of an array), and therefore, is withdrawn from further consideration on the merits along with the remaining non-elected claims. The requirement is still deemed proper and is therefore made FINAL. The Office action on the elected claims 1-11, 13-21, 25-27, 33-36, 39, and 40, follows:

***Claim Rejections - 35 USC § 102***

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2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1, 2, 10, 14, 15, 21, 25-27, 33-36, 39, and 40, are rejected under 35 U.S.C. 102(b) as being anticipated by US/5,379,601 to Gillett (listed in IDS).

Regarding claim 1, Gillett disclosed (Fig. 1a to 2c) a thermal switch, comprising: a heat source (210); a heat sink (220); and at least one liquid-metal droplet (230) disposed between the heat source (210) and the heat sink (220), the droplet (230) being configured to conduct heat from the heat source to the heat sink whenever the droplet is thermally coupled to the heat source (210) and the heat sink (220).

Regarding claim 14, 21, Gillett disclosed (Fig. 1a to 2c) a thermal switch for transferring heat into or away from a body (210, 220) comprising at least one drop (230) of liquid metal that transfers heat into or away from the body (210, 220) whenever the body (210, 220) is thermally coupled to the drop (230).

Regarding claim 25, Gillett disclosed (Fig. 1a to 2c) a thermal switch for controlling the flow of heat into or away from a body (210, 220), comprising: a drop (230) of a thermally conductive liquid; and an activation element (240) that is selectively movable between a first position (Fig. 2a) to activate the thermal switch and allow heat to flow into or away from the body (210, 220) through the drop (230), and a second position (Fig. 2c) to de-activate the

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thermal switch to reduce the flow of heat into or away from the body (210, 220) through the drop (230).

Regarding claims 2 and 26, Gillett disclosed (Fig. 1a to 2c) that the droplet is a liquid metal, which is mercury (column 1, lines 45-53).

Regarding claims 10, 15, Gillett disclosed that the droplet (230) is in constant thermal contact with one of the heat sink (220) and the heat source (210); and the other of the heat sink and the heat source (220, 210) comprises an actuator (240) that selectively thermally contacts the droplet (230).

Regarding claim 27, Gillett disclosed that the drop (230) is disposed on the metal contact (210, 220).

Regarding claims 33-36, 39, and 40, the method steps recited in the claims are inherently necessitated by the device structure as disclosed by Gillett.

4. Alternatively, claims 1, 2, 14, 33, and 34, are rejected under 35 U.S.C. 102(a) as being anticipated by US/6,437,240 to Smith (listed in IDS).

Regarding claims 1, 2, and 14, Smith disclosed (Fig. 25) an assembly, comprising: a heat source (1524b); a heat sink (1542); and at least one liquid-metal droplet (1550b) (column 5, lines 27+) disposed between the heat source (1524b) and the heat sink (1542), the droplet (1550b) of mercury (column 11, lines 48-49) being configured to conduct heat from the heat source to the heat sink whenever the droplet is thermally coupled to the heat source and the heat sink.

Regarding claims 33 and 34, the method steps recited in the claims are inherently necessitated by the device structure as disclosed by Smith.

***Claim Rejections - 35 USC § 103***

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over either Gillett or Smith, each taken alone.

Regarding claim 3, Gillett or Smith disclosed all, but the range of the diameter of the droplet to be 10 to 1000 microns.

It would have been obvious to a person of ordinary skill in the thermal switch art at the time the invention was made to select any workable range of the diameter of the droplet, including as claimed, or the value of the diameter of the droplet with the claimed range, in order to achieve desired rate of the thermal conduction, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233, and discovering an optimum value of a result (rate of the thermal conduction) effective variable (the diameter) involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

***Allowable Subject Matter***

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7. Claims 4-9, 11, 13, and 16-20, are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:

regarding claims 4-9, the base claim 4 recites: "at least one of the heat source and the heat sink comprises a micro-transducer" and the base claim 5 recites: "the heat source comprises a first micro-transducer and the heat sink comprises a second micro-transducer; and the droplet transfers heat from the first micro-transducer to the second micro-transducer whenever the droplet is thermally coupled to the first micro-transducer and to the second micro-transducer";

regarding claims 11 and 13, the base claim 11 recites: "the actuator comprises a flexible member that is selectively deflectable between a deflected position in which the flexible member contacts the droplet and a non-deflected position in which the flexible member is spaced from the droplet"; and,

regarding claims 16-20, the base claim 16 recites: "whenever the second thermally conductive member is in the first position, it contacts the drop, thereby allowing heat to be transferred into or away from the body through the thermal switch, and whenever the second thermally conductive member is in the second position, it is spaced from the drop to minimize the transfer of heat into or away from the body through the thermal switch". The aforementioned limitations in combination with all remaining limitations of the respective claims and with all limitations of the intervening and independent claims, are believed to render the subject matter of the aforementioned claims patentable over the art of record.

***Conclusion***

8. The additional prior art made of record and listed on PTO-892 was not relied upon, but is considered pertinent to Applicant's disclosure because of the teachings of various thermal switches and thermal valves.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anatoly Vortman whose telephone number is 571-272-2047. The examiner can normally be reached on Monday-Thursday, between 10:00 am and 8:30 pm..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mr. Jayprakash Gandhi can be reached on 571-272-3740. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Anatoly Vortman/  
Primary Examiner  
Art Unit 2835

AV